IV. PHYTOLOGY AND THERAPEUTICS.

THERAPEUTICAL NOTES AND DESCRIPTION OF PARTS OF MEDICINAL PLANTS GROWING IN KANSAS.

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There have been several more or less extensive lists of plants growing in Kansas made by different members of the Academy, reported at various meetings, and some work has been done in separating and commenting upon the medicinal character of those which have remedial action, but thus far there has not been any attempt to give a careful description of the parts of the plants used as medicine, and little has been said of medical virtues. At the present meeting of the Academy I shall confine myself to but two or three Kansas plants which have somewhat recently come to notice as medicinal, one of them taking a somewhat prominent position. In future meetings of the Academy I shall endeavor to collect information adding to the list of local medicinal plants, and shall endeavor to give such information as is not usually published in books of reference.

As I make reference to these I shall not try to arrange them in any scientific order. The three I shall comment upon at this meeting are plants which have come to my notice as medicinal within the last few years. The first two of which I shall speak have no wide reputation, and it is a question whether they deserve any more than a passing notice; but the plants are interesting, as may be seen. I refer to the *Cucurbita perrenis* Gray (wild pumpkin, buffalo gourd, man-in-the-ground), and the *Ipomea leptophylla* (wild morning-glory). The roots of these plants came to my notice about three years ago. They were sent to me asking for an analysis of their constituents, parties claiming for the roots remarkable tonic and aperient qualities. An analysis was made, and a report of the same was published in the proceedings of the American Pharmaceutical Association, 1895, p. 301. It is not necessary, therefore, for me to give the analysis in detail—suffice it to say that the analysis demonstrated the fact that the medicinal virtues, if any, resided in an oleo-resinous extractive, soluble in alcohol and in chloroform. Diluted alcoholic tinctures of the roots were very bitter, and fairly represented their virtues.

The wild pumpkin is found in western Kansas, where it is dry and sandy. In some parts of the state, where irrigation has been carried on, this root has become quite a pest. It is extremely large, and difficult to remove. It cannot be uprooted by an ordinary scraper, but has to be chopped out with the axe. The fruit, a spherical pepo, is smooth, yellow, and about the size of an orange. Within the hard, coriaceous rind, beside the fibers, there is a white, spongy, medullary matter and numerous ovate seeds. When the vine disappears in the winter the fruit remains in heaps as if some one had spilled a box of oranges. For this fruit some have claimed the purgative qualities of the Asiatic colocynth —one of the most valuable cathartics in the list of materials of medicine. The colocynth apple resembles the wild pumpkin fruit somewhat, but the former is very much more bitter. The thought has occurred that the colocynth apple might be profitably raised in the western part of our state. There is quite a

demand for it in this country: our supply coming mostly from the Levant, from whence it is shipped. It grows largely in Turkey and in the islands of the Archipelago.

Little may be said of the wild morning-glory, as it possesses scarcely a local interest. It is interesting, however, to state that this root, like the other, is enormous in size, containing a vast amount of stored-up nourishment, weighing in some cases as much as seventy pounds, and is amply protected against the hungry gophers, moles, mice and other animals by its intense bitterness. Professor Bessey, writing upon this subject, says that in the struggle for existence only those roots have remained whose bitterness was sufficient to overcome the hunger and thirst of the animals of the plains.

The most noteworthy plant growing abundantly in the state and of medicinal quality is *Echinacea angustifolia* (the vulgar name, niggerhead, from the black capitulum when ripe). I have had collected of the root of this plant for manufacturing houses no less than about 300 pounds. Students during the late summer and early fall months find in it a little profit at twenty-five cents a pound. Quite a lengthy article has just been published upon the plant by Prof. J. U. Lloyd, who stated that it had had quite a reputation as a remedial agent among the eclectic practitioners. Mr. R. C. Collison, a student in pharmacy, made an analysis of the root last spring; with the analysis he presented a brief history of the plant. From his paper I shall quote quite freely.

The root is dark brown externally and wrinkled longitudinally. The interior is grayish white, with radiating lines composed of alternating layers of dark and light tissue of a spongy nature. It has a very peculiar acrid, tingling taste, suggesting a solution of cocaine or tincture of aconite, and causing an increase in the flow of saliva to a considerable degree.

The plant is found growing in sandy soil and hillsides upon the prairie lands of Iowa and Illinois, southwest through Kansas and Colorado. The specific use, as given by the late Professor Scudder, is as follows: "Echinacea is an alterative of great value in strumous diathesis, syphilis, old sores, and wounds. Its most promising use, however, is as a powerful antiseptic, locally and internally, in diphtheria, typhoid conditions, cholera infantum, and blood-poisoning. It causes an excessive flow of saliva and perspiration. The fresh root scraped and given freely is the treatment used by the Sioux Indians for snake bite." It is said to be especially beneficial in typhoid, dysentery or any intestinal trouble requiring an antiseptic.

Although there are certain troubles in which it is indicated, its exact mode of action is not definitely known, and to it has been applied "A correcter of blood dyscrasia." It seems to cover the ground ascribed to antiseptics, antiferments, and antizymotics. Its first use was in these depressions produced by introduction into the blood of the poisons of serpents and insects. Some claims have been made for it in hydrophobia, boils, abscesses, carbuncles, and many pus-forming cellular inflammations; to it also has been attributed medicinal properties in treatment of cerebro-spinal meningitis. Fetid conditions of the bronchial tract, as fetid bronchitis, the stench of pulmonary gangrene, and carcinematous disorders are said to be effectually removed by the internal administration of this drug. A number of cases are cited by Dr. H. Lewis Hamilton, Colusa, Cal., in the *Eclectic Medical Journal*. A case is recorded of a Mr. W., dry-goods salesman. While measuring goods he accidentally punctured the index finger of his right hand with the brass pin attached to the price mark of the goods. He considered it a trivial matter and gave it no further notice, until twelve o'clock that night he was awakened from sleep by a sense of pain in his arm, which by this

time had become slightly swollen as far up as the elbow. We were called to see the patient some six hours after and found him suffering most excruciating pain. The entire arm and hand were swollen to an enormous size and greatly discolored. Temperature of arm, 103 degrees. We encased the entire arm and hand in absorbent cotton and ordered it to be kept wet with the following:

Echafolta	ounces 4
Aqua dist. q. s.	ounces 12

Internally we gave him:

Echafolta	drachms 2
Aqua dist. q. s.	ounces 4

Sig.: One teaspoonful every half-hour for two hours; then every hour.

We watched this case carefully, and as we wished to give echafolta a fair test we prescribed nothing but this drug.

End of thirty minutes, patient free from pain; temperature, 102.

End of two hours, swelling subsiding; temperature, 100.

End of four hours, swelling entirely gone; temperature normal.

End of six hours, the external application was discontinued, but the internal treatment continued until the prescription was exhausted.

Echafolta appears to be a liquid extract of Echinacea. Professor Lloyd, in summing up the value of the drug, says: "In Echinacea the medical profession has unquestionably a conspicuous remedy; one that a careful test of eleven years induces me to believe is destined to assume an important place in the materia medica."—*Eclectic Medical Journal*, August, 1897.

A minute description of the chemical analysis need not be given, but below will be found a table showing the results of this, giving the constituents and proportion of same in percentages.

Moisture in fresh drug	33.7	per cent.
Ash	8.38	"
Solubility of ash in:		
Water	37.0	per cent.
HCl	44.3	"
NaOH	17.65	"
Insoluble residue	1.05	"
Petroleum spirit extract	1.408	"
Ether extractive	1.996	"
Solubilities of other extractives in:		
Water	18.837	per cent.
Alcohol	57.308	"
Insoluble residue	23.855	"
Solubility of alcoholic-etherial extract in:		
Carbon bisulfide	49.7	per cent.
Benzene	19.2	"
Residue insoluble in dilute acids	31.1	"
Alcoholic extractive	10.32	"
Of the alcoholic extract, the following are the constituents and percentages:		
Resin	9.2	per cent.
Vegetable acids	39.0	"
Coloring matter	51.8	"
Aqueous extract	19.956	"

Inorganic constituents:

Sodium, potassium, calcium, magnesium, aluminum, iron, phosphates, and carbonates.

In 1890 Mr. S. R. Boyce, my assistant, made a distillation of a large quantity of the ground root. He obtained by this process an oil of a yellowish color, which soon blackened. This oil has a very acrid taste and pungent odor, evidently containing the medical properties of the root in concentrated form.

ROOT TUBERCLES AND THEIR PRODUCTION BY INOCULATION.

BY D. H. OTIS, MANHATTAN.

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HISTORY AND LITERATURE.

GENERAL STATEMENT.—By examining the roots of such plants as clover, alfalfa, beans, and peas, one will usually find, scattered over their exterior surface, tubercles of various sizes and shapes. These tubercles are, with very few exceptions, peculiar to a certain order of plants known as Leguminosæ, and, as far as agricultural plants are concerned, only to the suborder Papilionaceæ. These tubercles are the outgrowths of the plants themselves, and are produced by the action of certain micro-organisms working within the tissues of the root. Formerly, these tubercles were considered abnormal appendages and as injurious to the plants; but later observations revealed the fact that, where these tubercles were wanting, the plants did not make the growth that was made by plants where the tubercles were present. Later examination has brought out the fact that these tubercles are the homes of minute microscopic bacteria, *Bacillus radicicola* Beyer. The bacteria have the remarkable property of taking the free nitrogen of the atmosphere and transforming it into available compounds for plant food. So it is a case of symbiosis, the plant furnishing food and shelter for the bacteria, and the bacteria in turn furnishing the plant with nitrogen. This is what makes the leguminous plants so valuable as soil enrichers, and especially prized for green manuring.

EARLY OPINIONS CONCERNING THE TUBERCLES.—It is just about a century ago that root tubercles became the subject of agricultural inquiry and experimentation. The early ideas were very crude, some supposing the tubercles to be fungi, others lenticels, root branches, swellings caused by insects, and some used them as a part of the description of plants. Even those who took them to be peculiar to the order Leguminosæ entertained widely different views as to their functions. Some thought they were swollen lateral roots used in the absorption of food, or, still better, a storehouse for reserved food material. Others maintained that they were dwarfed roots, while still others classed them as imperfect buds, capable of developing into new plants. About fifty-five years ago Boussingault carried on a series of experiments with a large number of plants, from which he concluded that not even the leguminous plants had the power to obtain free nitrogen from the air. Similar experiments at Rothamsted confirmed Boussingault's conclusions. It should be noted, however, that these experiments were conducted under the conditions of sterilization and enclosure which eliminated the micro-organisms from the soil. Thus it will be seen that the earliest conclusions were very incomplete, and in many cases were the result of mere superficial observation.

Investigation of the structural and etiological phase of the subject was begun in 1816. It was started by Woronin, and he was followed by Eriksson, DeVries, Schindler, Cornu, Mattei, Kny, Prillieux, and, in 1879, by B. Frank. It was about this time that M. Berthelot called in question the accuracy of the conclu-